

1. A method for chemically cleaning a countermeasure washdown system on board ships comprising

isolating a section of piping in the countermeasure washdown system for the delivery of a cleaning solution, wherein  
5 said system of piping includes a plurality of washdown spray nozzles and aluminum piping,

introducing an acid cleaning solution into the section, said solution having a pH which does not deleteriously affect said aluminum piping,

10 maintaining the cleaning solution in the section to remove scale and sediment from the interior of the section,

removing the cleaning solution containing the scale and sediment from the section to provide a cleaned interior section, and

15 restoring the cleaned section with the system.

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2. The method of claim 1 wherein the pH of said acidic cleaning solution is maintained acidic at a pH on the order of about 2.0 to about 2.2.
3. The method of claim 2 wherein the pH is monitored during cleaning to achieve a pH level to indicate an effectively cleaned pipe section.
4. The method of claim 1 wherein the cleaning solution is circulated through the isolated pipe section in a closed loop and a spent cleaning solution is removed from the loop.
5. The method of claim 1 wherein the system remains at least in part operational during the cleaning.
6. The method of claim 1 wherein a mobile unit initially contains the cleaning solution to be introduced into the system.
7. The method of claim 6 wherein a hose connected from the mobile unit introduces a cleaning solution into the isolated pipe section.
8. The method of claim 1 wherein the cleaning solution contains an organic acid.

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9. The method of claim 8 wherein the organic acid is selected from the group consisting of formic, acetic, propionic, citric, glycolic, lactic, tartaric, polyacrylic, succinic, sulfonic, and the like.
10. The method of claim 9 wherein the cleaning solution additionally contains an acid inhibitor and a dispersing agent.
11. The method of claim 1 wherein said spent cleaning solution is rendered environmentally safe before removal from said system.
12. The method of claim 11 wherein the cleaning solution is rendered environmentally safe by adding a treating agent to the spent cleaning solution prior to removal.
13. The method of claim 1 wherein said spray nozzles are inactivated by removing and replacing them with temporary fittings.
14. The method of claim 13 wherein the temporary fitting is a valve, plug, pipe, or combinations thereof.

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15. A method for chemically cleaning a countermeasure washdown system on board ships comprising

isolating a section of piping in the countermeasure washdown system for the delivery of a cleaning solution, wherein

5 said section includes a plurality of washdown spray nozzles and aluminum piping,

inactivating said spray nozzles by removing and replacing them with temporary fittings,

10 introducing an acid cleaning solution having a pH of about 2 to about 2.2 into the section,

circulating the cleaning solution through the section in a closed loop to remove scale and sediment from the interior of the section,

15 removing the cleaning solution containing the scale and sediment from the section to provide a cleaned interior section, and

restoring the cleaned section with the system.

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16. The method of claim 15 wherein the pH is monitored during cleaning to achieve a pH level to indicate an effectively cleaned pipe section.
17. The method of claim 15 wherein the cleaning solution contains an organic acid.
18. The method of claim 17 wherein the organic acid is selected from the group consisting of formic, acetic, propionic, citric, glycolic, lactic, tartaric, polyacrylic, succinic, sulfonic, and the like.
19. The method of claim 15 wherein the cleaning solution is rendered environmentally safe by adding a treating agent to the spent cleaning solution prior to removal.
20. The method of claim 15 wherein the temporary fitting is a valve, plug, pipe, or combinations thereof.
21. The method of claim 15 further comprising configuring the isolated section into said closed loop by using connectors between (a) an end of the section and a manifold, (b) the manifold and a pump, and (c) the pump and a source of cleaning solution.

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22. The method of claim 21 wherein the connectors comprise a plurality of hoses which connect said temporary fittings to said manifold for circulation of cleaning solution through the isolated section in said closed loop.
23. The method of claim 21 wherein the isolated section is selectively operatively connected to a fire main system of the ship for restoration of the cleaned section with the countermeasure washdown system and the fire main system after cleaning.
24. The method of claim 21 wherein said source of cleaning solution is provided by a mobile unit operatively connected to the manifold for introducing cleaning solution into the loop.
25. The method of claim 21 comprising a plurality of manifolds in said closed loop and a plurality of hoses which connect a plurality of temporary fittings to said plurality of manifolds for circulation of cleaning solution through the isolated section in said closed loop.

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26. A method for chemically cleaning a countermeasure washdown system on board ships comprising

isolating a section of piping in the countermeasure washdown system for the delivery of a cleaning solution, wherein said section includes a plurality of washdown spray nozzles and aluminum piping,

inactivating said spray nozzles by removing and replacing them with temporary fittings,

configuring the isolated section into a closed loop by using connectors between (a) an end of the section and a manifold, (b) the manifold and a pump, and (c) the pump and a source of cleaning solution,

wherein the connectors comprise a plurality of hoses which connect said temporary fittings to said manifold for circulation of cleaning solution through the isolated section in said closed loop,

introducing an acid cleaning solution having a pH of about 2 to about 2.2 into the section,

circulating the cleaning solution through the section in said closed loop to remove scale and sediment from the interior of the section,

removing the cleaning solution containing the scale and sediment from the section to provide a cleaned interior section, and

restoring the cleaned section with the system.

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